

11. (New) The twin-screw extruder according to Claim 10, wherein said rotor segment provides a plurality of tip clearances different from each other in the axial direction of said rotor segment.

REMARKS

Favorable reconsideration of the present application is respectfully requested.

Claim 4 has been cancelled. New Claims 10 and 11 have been introduced. Of these, Claim 10 is directed to an extruder having the screw set of Claim 1. Claim 11 is based upon cancelled Claim 4, and depends from Claim 10. Claims 1-3 and 5-11 are active in the application.

As is described on page 3 of the specification, the invention is directed to solving the problem wherein slight shifts in the axial position of screw sets within an extruder can cause interference between the elements of the screw sets unless spacers are introduced. The invention is based upon the idea that each screw set is formed from segments having the same sectional shape, except for the crest portions, whereas only the crest portions are shaped depending on the function of each segment ("Thus, in the present invention, the crest portion of the blade is changed depending on the function of each segment, whereas it is essential that the segments have the same sectional shape except for portions necessary for adjusting the distance between the blade tip and the inner barrel surface"; see sentence bridging pages 4 and 5). Since the various segments are formed with the same sectional shape except for the crest portions, axially misaligned screw sets will not interfere with each other, even when all of the segments are directly interconnected without using any spacers (page 11, lines 7-11).

For example, referring to the non-limiting embodiments of the figures, a screw set in the chamber 4 of a barrel 3 can have one or more screw segments 11, one or more rotor

segments 12 and one or more kneading segments 13, which may be arranged in the order shown in Figure 1A. The kneading segment 12 is comprised of kneading rotors 14-16 which may have different tip clearances 14b, 14c, but which have the same sectional shape along their axial lengths. Also, except for the crest portions, the kneading rotors 14-16 have the same sectional shapes as the screw segment 11 and the kneading disks 13 (page 9, lines 8-9).

Claim 1 recites a screw set in a twin screw extruder, in which each screw set comprises a rotor segment comprising at least one kneading rotor having a plurality of blades, and in which the kneading rotor has a constant sectional shape in the axial direction, except for the crest portions of the blades. Claim 1 further recites that the screw segment has the same sectional shape as the rotor segment, except at the crest portions. New Claim 10 recites parallel limitations for a twin screw extruder. These features are not taught in U.S. patent 5,947,593 (Inoue et al), which was applied against Claims 1-6, 8 and 9 under 35 U.S.C. § 102, and against dependent Claim 7 under 35 U.S.C. § 103.

The Examiner has alleged that Inoue et al discloses a screw set in which the kneading blades 7 have the same sectional shape in the axial direction, and a screw segment having the same sectional shape as a portion of the rotor segment, except for the crest portions of the kneading blades. However, this is clearly not the case.

Figure 3 of Inoue et al is a sectional view of the kneading rotors 7, taken at section line III-III in Figure 2A. Although no figure of Inoue et al illustrates the sectional shape of the screw portion 1a, a similar sectional line sectional view taken at line A-A (see Attachment hereto) at the screw segment portion 1a of Figure 1 in Inoue et al would provide the sectional shape shown at Figure 1A on the Attachment. The sectional shape (except for the crest portions) of the screw segment shown in Attachment Figure 1A is substantially different from that of Figure 3. Thus, there is no basis for the Examiner's allegation that Figure 1 of Inoue

et al teaches a screw segment having a same shape (except for the crest portions) as the kneading blades. Claims 1, 10 and their dependent claims, are therefore believed to clearly define over this reference.

Concerning the rejection under 35 U.S.C. § 112, the claims have been revised in light of this rejection, which is believed to be moot. However, the Examiner's attention is drawn to the following points:

1. Claim 1 has been amended to clarify that the recited elements are provided *for each screw set*. Thus, each screw set must have both the rotor segment and the screw segment. Similarly, with respect to Claim 2, it has been clarified that each screw set comprises the further kneading disk.

2. The claims have been amended to clarify that the kneading rotor has a "constant" sectional shape in the axial direction, whereas the screw segment has the "same" sectional shape as the rotor segment.

3. Concerning Claim 5, it is noted that so long as the same sectional shape is maintained among the segments, the twist angle of the blade with respect to the axial direction may be different from one segment to another segment. Page 5, lines 2-4. Thus, the parallel kneading blade according to Claim 5 could have the same sectional shape as that of the screw blade.

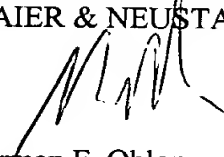
4. The word "clearance" is now limited to the claims directed to the combination of the twin screw extruder including both a barrel and screw sets.

The specification has been amended as required.

Applicant therefore believes that the present application is in condition for allowance and respectfully solicits an early Notice of Allowability.

Respectfully submitted,

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IN THE SPECIFICATION

Please change the paragraph beginning at page 8, line 29, to read:

The kneading disk segment 13 comprises a plurality of kneading disks 13a in the form of flat plates. Each kneading disk 13a has the same sectional shape as that of the screw 11a; that is, blades are arranged in a 180°-opposing relation about the center O of rotation thereof. Further, the kneading disks 13a are interconnected such that the blades of the adjacent kneading disks 13a and 13a are positioned [600] 60° out of phase from each other, thereby constituting the kneading disk segment 13 for kneading the material to be kneaded through tip clearances between the blade crests and the inner wall surface of the chamber 4.

Please change the paragraph beginning at page 14, line 9, to read:

The different types of kneading rotors 14 - 16, shown in Figs. 3A to 3C, were prepared in which the diameter was set to 58 mm, the lower tip clearance provided by each of the taller tip portions 14b - 16b was set to 0.5 mm, and the greater tip clearance provided by each of the lower tip portions 14c - 16c was set to 3 mm. The kneading blades 14a - 16a of the kneading rotors 14 - 16 were set such that the forward type has a twist angle of 300 with respect to the axial direction, the neutral type has a twist angle of [00] 0° with respect to the axial direction and the backward type has a twist angle of 30° with respect to the axial direction. Then, the rotor segment 12 having a segment length of 50 mm was fabricated by

arranging the three types of kneading rotors 14 - 16 in the order of the forward type, the neutral type, the forward type, the neutral type, and the backward type in the flowing direction, as shown in Fig. 5.

IN THE CLAIMS

--1. (Amended) A screw set [for] in a twin-screw extruder for mixing and dispersing a material to be kneaded into a kneaded product having a desired state of kneading, each said screw set comprising:

a rotor segment comprising at least one kneading rotor, said kneading rotor having a plurality of kneading blades[,] which provide a plurality of tip clearances different from each other at least in the circumferential direction, [and] said kneading rotor having [the same] a constant sectional shape in the axial direction, except for crest portions of said kneading blades; and

a screw segment comprising at least one screw blade, [a portion of] said screw segment, except for crest portions of the screw blades thereof, having the same sectional shape as [a portion of] said rotor segment, except for the crest portions of said kneading blades.

2. (Amended) The screw set for a twin-screw extruder according to Claim 1, each said screw set further comprising:

a kneading disk segment comprising at least one kneading disk, [a portion of] said kneading disk segment, except for crest portions of disk blades thereof, having the same sectional shape as [the portion of] said rotor segment, except for the crest portions of said kneading blades.

3. (Amended) The screw set for a twin-screw extruder according to Claim [1] 2, wherein all of [segment members] said kneading disks have the same sectional shape as [the portion of] said rotor segment, except for the crest portions of said kneading blades.

4. (Cancelled).

10-11. (New).--